

Claims

- [c1] 1. A method performed associated with a jack, said jack containing a plurality of connection points, said method comprising:
examining an impedance present between at least a pair of said plurality of connection points; and
determining whether a headset is present in said jack based on a value of said impedance.
- [c2] 2. The method of claim 1, wherein the presence of said headset is determined without using a mechanical switch which is in one position when said headset is present and is in another position otherwise.
- [c3] 3. The method of claim 1, further comprising generating a signal having a first logical value if said headset is present and having a second logical value otherwise.
- [c4] 4. The method of claim 1, wherein said examining comprises measuring a voltage representing said impedance between a node connected to one of said plurality of connection points and a ground terminal.
- [c5] 5. A method of detecting a type of headset inserted in a jack, said jack containing a plurality of connection

points, said method comprising:
receiving a first headset into said jack, said first headset making contact with at least one of said plurality of connection points upon insertion into said jack;
measuring impedance between at least one pair of said plurality of connection points; and
determining whether said first headset is one of stereo headset, cellular headset and stereo+cellular headset based on said measuring.

[c6] 6. The method of claim 5, wherein said measuring measures a voltage between a node connected to one of said plurality of connection points and a ground terminal to determine said impedance.

[c7] 7. A method performed associated with a jack, said jack containing a plurality of connection points, said method comprising:
(a) receiving a first headset into said jack, said first headset making contact with at least one of said plurality of connection points upon insertion into said jack, wherein said first headset is of a first type;
(b) determining that a headset of said first type is inserted into said jack by measuring impedance between at least one pair of said plurality of connection points;
(c) receiving a second headset into said jack, said second headset making contact with at least one of said plurality

of connection points upon insertion into said jack, wherein said second headset is of a second type;
(d) determining that a headset of said second type is inserted into said jack by measuring impedance between at least one pair of said plurality of connection points;
(e) receiving said first headset again into said jack; and
(f) determining that a headset of said first type is inserted into said jack.

[c8] 8. The method of claim 7, wherein said method is performed by an apparatus, wherein (f) can be performed without initializing said apparatus after performing (a) – (d).

[c9] 9. A device enabling a user to play an audio signal, said device comprising:
a jack containing a plurality of connection points; and
a detector circuit examining an impedance present between at least a pair of said plurality of connection points and determining whether a headset is present in said jack based on a value of said impedance.

[c10] 10. The device of claim 9, wherein said detector circuit determines the presence of said headset without using a mechanical switch which is in one position when said headset is present and is in another position otherwise.

- [c11] 11. The device of claim 9, wherein said detector circuit measures a voltage between said pair of said plurality of connection points and determines that said headset is present if said voltage is low compared to a reference voltage.
- [c12] 12. The device of claim 11, wherein said detector circuit comprises:
a first node being coupled to receive a bias voltage,
wherein said first node is coupled to one of said pair of connection points and wherein the other one of said pair of connection points is coupled to Vss, whereby said bias voltage is presented at said first node if said headset is not present and a low voltage is presented at said first node if said headset is present; and
a comparator having a first input terminal and a second input terminal, said first input terminal being connected to said first node, said second input being connected to said reference voltage, wherein said reference voltage is generated as a fraction of said bias voltage, wherein said comparator generates a signal having a first logical value if said headset is present and having a second logical value otherwise.
- [c13] 13. The device of claim 12, wherein said reference voltage equals $(7 \times \text{said supply voltage} / 8)$, wherein '*' represents multiplication operator and '/' represents division

operator.

[c14] 14. The device of claim 12, wherein said detector circuit further comprises:

a resistor connecting said first node to a second node;
a micbias driver providing a driver voltage on said second node to bias any microphone present in said headset; and

a first switch to couple a supply voltage to said second node when in a closed state, said first switch being in an open state if said micbias driver is providing said driver voltage on said second node.

[c15] 15. The device of claim 14, wherein said detector circuit further comprises:

a plurality of components detecting a type of said headset, wherein said plurality of components are turned off if said headset is determined to be absent.

[c16] 16. The device of claim 15, wherein said detector circuit determines whether said headset is removed from said jack after determining that said headset is present in said jack, said detector circuit further comprising:

a second switch to couple a detect pulse to said second node when in a closed state, said third switch being in an open state if said micbias driver is turned on, said detect pulse being of short pulse width and being repeated with

a long period, thereby reducing total power consumption of said device.

[c17] 17. The device of claim 16, further comprising:
a processing unit receiving an interrupt from said detector circuit if said headset is determined to be present;
and
a register storing a bit indicating said headset is determined to be present.

[c18] 18. A device enabling a user to play an audio signal, said device comprising:
a jack containing a plurality of connection points, said jack being designed to receive a first headset, said first headset making contact with at least one of said plurality of connection points upon insertion into said jack; and
a detector circuit measuring an impedance between at least one pair of said plurality of connection points and determining a type of said first headset according to said impedance.

[c19] 19. The device of claim 18, wherein said type comprises one of a stereo headset type, a cellular headset type and a stereo+cellular headset type according to said impedance.

[c20] 20. The device of claim 19, wherein said detector circuit

determines whether said first headset is of said stereo headset type by measuring a first voltage between a first pair of said plurality of connection points and determines that said first headset is a stereo headset type if said first voltage is low compared to a reference voltage.

- [c21] 21. The device of claim 20, wherein said detector circuit comprises:
- a first node being coupled to receive a bias voltage, wherein said first node is coupled to one of said first pair of connection points and wherein the other one of said first pair of connection points is coupled to Vss, whereby a low voltage is presented at said first node if said first headset is of said stereo headset type and a high voltage is presented at said first node if said first headset is not of said stereo headset type; and
 - a first comparator having a first input terminal and a second input terminal, said first input terminal being connected to said first node, said second input terminal being connected to said reference voltage, wherein said reference voltage is generated as a fraction of said bias voltage, wherein said first comparator generates a first signal having a first logical value if said first headset is of said stereo headset type and having a second logical value otherwise.

- [c22] 22. The device of claim 20, further comprises a logic gate receiving a first logic input and a second logic input, wherein said first logic input indicates whether said first headset is present in said jack and wherein said second logic input is coupled to receive said first signal generated by said first comparator.
- [c23] 23. The device of claim 20, wherein said detector circuit determines whether said first headset is a cellular headset type by measuring a second voltage between a second pair of said plurality of connection points if said first headset is determined not to be of said stereo headset type and determines that said first headset is of said cellular headset type if said second voltage is high compared to said reference voltage.
- [c24] 24. The device of claim 23, wherein said detector circuit comprises:
a third node being coupled to receive a supply voltage, wherein said third node is coupled to one of said second pair of connection points and wherein the other one of said second pair of connection points is coupled to Vss, whereby said supply voltage is presented at said third node if said first headset is of said cellular headset type and a low voltage is presented at said third node if said first headset is not of said cellular headset type; and
a second comparator having a first input terminal and a

second input terminal, said first input terminal being connected to said third node, said second input terminal being connected to said reference voltage, wherein said second comparator generates a second signal having a first logical value if said first headset is of said cellular headset type and having a second logical value otherwise.

[c25] 25. The device of claim 24, wherein said detector circuit determines that said first headset is a stereo+cellular headset type if said first headset is determined not be of either of of said stereo headset type and said cellular headset type.

[c26] 26. The device of claim 25, wherein said second pair of connection points comprise a connection point which connects to a speaker terminal and another connection point which connects a ground terminal in said first headset.

[c27] 27. The device of claim 26, further comprising:
a resistor connecting said first node to a second node;
a micbias driver providing a driver voltage on said second node to bias any microphone present in said first headset;
a first switch to couple said supply voltage to said second node when in a closed state, said first switch being

in a open state if said micbias driver is providing said driver voltage on said second node; and
a second switch to couple said supply voltage to said third node through a second resistor when in a closed state, said second switch being in a open state if said first headset is determined to be of said stereo headset type.

[c28] 28. The device of claim 27, wherein said detector circuit determines whether a button is pressed if said first headset is of said stereo+cellular headset type or cellular headset type, wherein said first comparator is designed to indicate whether said button is pressed.

[c29] 29. The device of claim 28, wherein said detector circuit determines whether said button is pressed, said detector circuit further comprising a third switch to couple a detect pulse to said second node when in a closed state, said third switch being in a open state if said micbias driver is turned on, said detect pulse being of short pulse width and being repeated with a long period, thereby reducing total power consumption of said device.

[c30] 30. The device of claim 29, wherein said reference voltage equals (said supply voltage /8), wherein '/' represents a division operator.

- [c31] 31. The device of claim 30, further comprises a register, wherein said register comprises a plurality of bits indicating a type of said first headset.
- [c32] 32. The device of claim 31, further comprises a processing unit receiving an interrupt from said detector circuit if said button is determined to be pressed.
- [c33] 33. An apparatus associated with a jack, said jack containing a plurality of connection points, said apparatus comprising:
means for examining an impedance present between at least a pair of said plurality of connection points; and
means for determining whether a headset is present in said jack based on a value of said impedance.
- [c34] 34. The apparatus of claim 33, wherein said means for determining determines the presence of said headset without using a mechanical switch which is in one position when said headset is present and is in another position otherwise.
- [c35] 35. The apparatus of claim 33, further comprising means for generating a signal having a first logical value if said headset is present and having a second logical value otherwise.

- [c36] 36. The apparatus of claim 33, wherein said means for examining measures a voltage representing said impedance between a node connected to one of said plurality of connection points and a ground terminal.
- [c37] 37. An apparatus detecting a type of headset inserted in a jack, said jack containing a plurality of connection points, said apparatus comprising:
means for receiving a first headset into said jack, said first headset making contact with at least one of said plurality of connection points upon insertion into said jack;
means for measuring impedance between at least one pair of said plurality of connection points; and
means for determining whether said first headset is one of stereo headset, cellular headset and stereo+cellular headset based on said measured impedance.
- [c38] 38. The apparatus of claim 37, wherein said means for measuring measures a voltage between a node connected to one of said plurality of connection points and a ground terminal to determine said impedance.
- [c39] 39. An apparatus associated with a jack, said jack containing a plurality of connection points, said apparatus comprising:
means for receiving a first headset into said jack, said

first headset making contact with at least one of said plurality of connection points upon insertion into said jack, wherein said first headset is of a first type;
means for determining that a headset of said first type is inserted into said jack by measuring impedance between at least one pair of said plurality of connection points;
means for receiving a second headset into said jack, said second headset making contact with at least one of said plurality of connection points upon insertion into said jack, wherein said second headset is of a second type;
means for determining that a headset of said second type is inserted into said jack by measuring impedance between at least one pair of said plurality of connection points;
means for receiving said first headset again into said jack; and
means for determining that a headset of said first type is inserted into said jack.